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(71) Applicant Dome Investments Limited (Incorporated in Ireland) 63 Serpentine Avenue, Dublin 4, Ireland	(58) Field of search UK CL (Edition K) D1A, D1P PDV PDX PE PFX PG PH PJ PK PN INT CL ⁶ D06L 1/22
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(54) "A cleaning process for removing stains"

(57) A method for removing stains from a silk or woollen fabric article comprises the step of applying steam in jet form directed at the fabric in the area of the stain. A solution of detergent and perchlorethylene is applied to the stain area while the stain area is still wet after the application of steam. The fabric is then dried in air at a temperature of 30°C for 2 hours to evaporate the water and perchlorethylene. After the water and perchlorethylene have been evaporated, the article is then placed in dry cleaning apparatus and subjected to a normal dry cleaning cycle.

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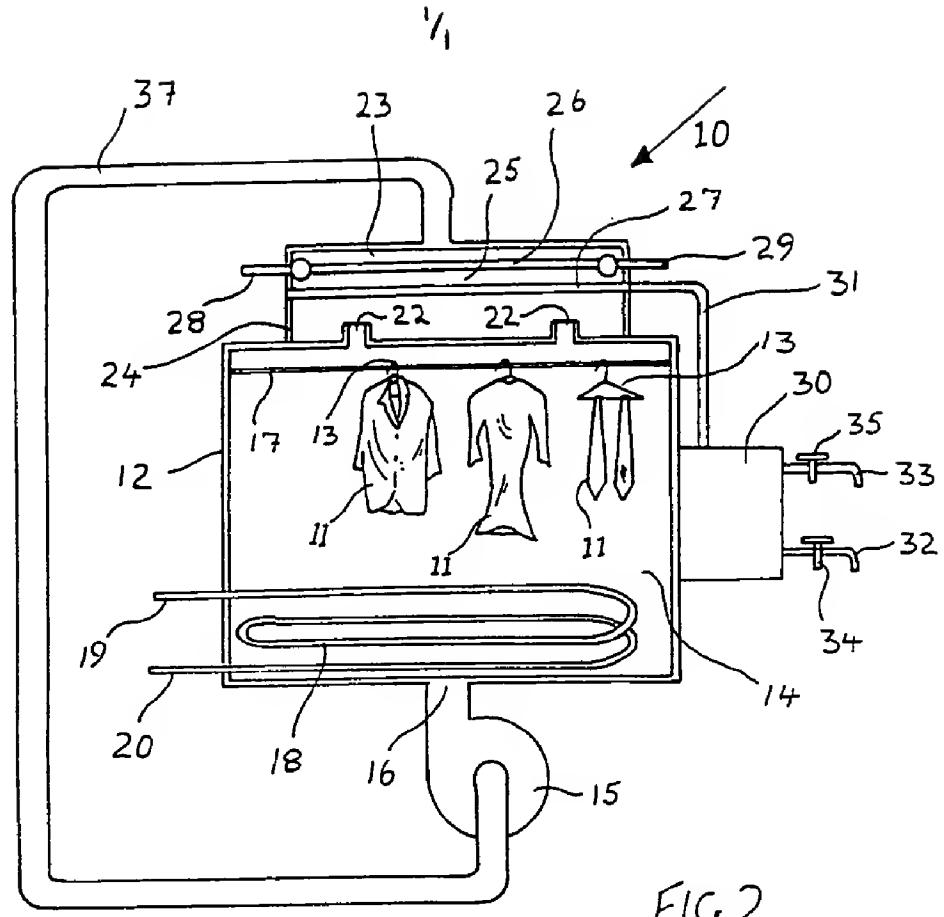


FIG 2

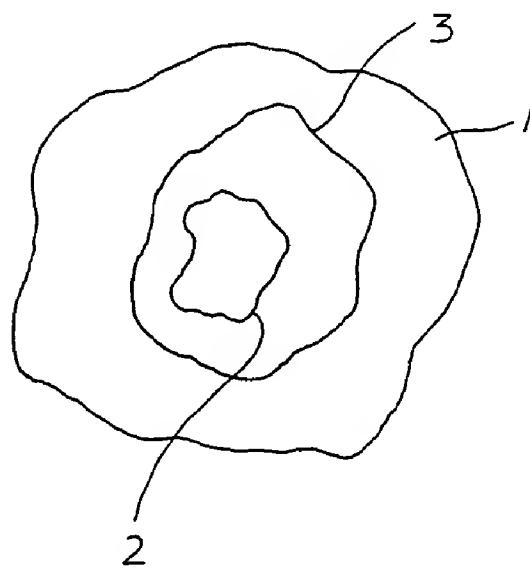


FIG 1

The present invention relates to a method for removing a stain from a fabric article, and the invention also relates to an apparatus for drying a fabric article.

Dry cleaning is a process commonly used for removing stains from fabric articles, such as, for example, garments, curtains, bedclothes and the like. However, it has been found that problems arise in the removal of stains from fabric articles of natural fibres, in particular fabric articles of silk and wool using known dry cleaning processes. Two types of stains are normally encountered, namely water based stains and oil based stains. Water based stains are generally related to food and drink and are generally removed prior to the dry cleaning process using an application of water or steam. The water or steam is generally applied to the article in the area of the stain. A solution of detergent and perchlorethylene is then applied to the area of the stain for removing any water staining resulting from the original application of water or steam. After the application of the solution of detergent and perchlorethylene, the fabric article is then quickly placed in dry cleaning apparatus, where the actual dry cleaning process takes place for removing remaining stains and general soiling.

However, it has been found that in many cases, particularly in the case of delicate silk and woollen

articles, the water stain remaining from the original application of water or steam is not completely removed, and indeed, where the water stain is fully removed, other adverse effects occur, such as colour loss, disturbance of the fibres of the fabric, and in many cases, shrinkage of the article. In an attempt to overcome these problems, stronger detergents have been used to improve the emulsification effect of the water and perchlorethylene. However, while such attempts have had limited success, they do not overcome the problem.

There is therefore a need for a method for removing a stain from a fabric article which overcomes the problems of known methods. There is also a need for an apparatus for use with the method.

The present invention is directed towards providing such a method and apparatus.

According to the invention, there is provided a method for removing a stain from a fabric article, the method comprising the following steps in the following order:

- 20 applying water or steam to the fabric in the area of the stain,
- applying a solution of detergent and perchlorethylene in the area of the stain,

subjecting the fabric to a drying environment at a temperature not exceeding 60°C for evaporating water and perchlorethylene from the fabric,

on substantially all of the water and

- 5 perchlorethylene being evaporated from the fabric,
subjecting the article to a dry cleaning process to
remove residual staining in the fabric.

In one embodiment of the invention, the drying environment is at a temperature in the range of 15°C to
10 45°C.

In another embodiment of the invention, the fabric article is subjected to the drying environment for a time period of up to 24 hours

- Advantageously, the fabric article is subjected to the
15 drying environment for a time period in the range of 1 hour to 4 hours.

In one embodiment of the invention, the drying environment comprises a drying medium which preferably is air.

- 20 Preferably, the solution of detergent and perchlorethylene is applied to the fabric while the fabric is wet after the application of water or steam.

Advantageously, the solution of detergent and perchlorethylene is applied to the fabric immediately after the application of water or steam.

Preferably, the solution of detergent is a solution of
5 dry side soap.

Additionally, the invention provides apparatus for drying a fabric article in accordance with the method of the invention, the apparatus comprising a housing defining a drying chamber for receiving the fabric article and a drying medium, an outlet from the drying chamber for delivering evaporates from the fabric article, and collecting means communicating with the outlet for collecting the evaporates.
10

The invention will be more clearly understood from the following description of a preferred embodiment
15 thereof, given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a piece of fabric of an article having a stain thereon being treated in accordance with a method according to the
20 invention, and

Fig. 2 is a sectional elevational view of

apparatus according to the invention for drying a fabric article.

Referring to the drawings, there is provided drying apparatus according to the invention indicated generally by the reference numeral 10 for use in a method also according to the invention for removing a stain from a fabric article. A piece 1 of the fabric article having a stain 2 thereon is illustrated in Fig. 1. The stain 2 may be a water based or an oil based 10 stain. The fabric may be any type of material, whether made from natural fibres or manmade fibres. The method is particularly suitable for delicate fabrics, such as, for example, those of silk or wool. Before describing the drying apparatus 10, an example of the method for 15 removing the stain 2 from the fabric 1 will first be described.

In accordance with the method of the invention, the fabric 1 is laid out on a relatively smooth, even surface, typically a table or workbench. The stain 2 20 is first treated with water or steam. In this embodiment of the invention, steam is applied to the fabric 1 over the area of the stain 2 and in the general area indicated by the reference numeral 3 around the stain 2. The steam is delivered to the area 25 3 of the fabric 1, as a relatively high pressure jet

from a suitable nozzle, which is normally hand held. Such steam jet nozzles will be known to those skilled in the art. The jet of steam is applied to the area 3 for a time period of up to 2 minutes, although this may 5 be lengthened or shortened, depending on the stain and the ease or difficulty with which it is being removed by the steam. On the stain 2 being removed, the jet of steam is withdrawn from the fabric. Immediately, while the area 3 of the fabric 1 is still wet, a solution of 10 detergent and perchlorethylene in liquid form is applied to the area 3 by dabbing. The detergent of the solution is a non-water based detergent, namely, a dry side soap, which in this case is a detergent sold under the Trade Name TAIFUN HOCHKONZ by Seitz GmbH. The 15 detergent and perchlorethylene are mixed in the following proportions:

perchlorethylene	90%
detergent	10%.

The solution of detergent and perchlorethylene is 20 allowed to soak into the fabric 1 for a period of approximately 5 minutes. The fabric 1 is then placed in a drying environment, and is preferably hung from a hanger or peg in the drying environment until the water and perchlorethylene in the fabric 1 have substantially 25 evaporated. This thus leaves a coating of detergent only in the area 3. In this embodiment of the

invention, the fabric 1 is hung in the drying apparatus 10 illustrated in Fig. 2. The drying apparatus 10 is described below, as is the drying cycle. On the water and perchlorethylene being almost totally evaporated
5 from the fabric 1 or evaporated to a stage where further evaporation is no longer practical, the fabric 1 is removed from the drying apparatus 10 and placed in dry cleaning apparatus (not shown). The fabric 1 is then cleaned in the dry cleaning apparatus using a
10 normal dry cleaning process. Such dry cleaning apparatus and process will be well known to those skilled in the art.

Returning now to the drying apparatus 10, the drying apparatus 10 comprises a main housing 12 defining a
15 drying chamber 14 for receiving the fabric article and a drying medium, which in this case is air. Rails 17, one of which is illustrated in Fig. 2, are provided in the upper portion of the drying chamber 14 from which the fabric articles may be suspended on hangers, hooks,
20 pegs or the like. In this embodiment of the invention, fabric garments 11 are illustrated suspended on hangers 13 in the drying chamber 14. A fan 15 delivers the air through an inlet 16 into the drying chamber 14 for drying, in other words, for evaporating the water and
25 perchlorethylene from the fabric 1 of the garments 11. A heating coil 18 which is steam heated is mounted in

the lower portion of the drying chamber 14 for heating air. Steam from a steam source (not shown) is delivered to the steam coil 18 through an inlet 19. An outlet 20 from the steam coil 18 returns steam from the 5 coil 18. Air outlets 22 from the drying chamber 14 exhaust air as well as the water and perchlorethylene evaporated from the fabric 1 of the garments 11 into a condensing means, namely a condenser 23 mounted above the housing 12. The condenser 23 comprises a condenser 10 housing 24 defining a hollow interior region 25. Cooling coils 26 are provided in the hollow interior region 25 for condensing the water and perchlorethylene. An inlet 28 to the cooling coils 26 delivers chilled water to the coils 26, while an outlet 15 29 returns the water from the cooling coils 26. Drip trays 27 below the cooling coils 26 collect the condensed water and perchlorethylene which is delivered to a collecting means, namely, a collecting tank 30 through a pipe 31. The collecting tank 30 acts to 20 separate the water and perchlorethylene. Water, being lighter than perchlorethylene, floats on the top of the perchlorethylene in the tank 30. An outlet 32 from the bottom of the tank 30 permits the perchlorethylene to be drawn off. A drip feed 33 from the tank 30 delivers 25 water from the tank 30. Valves 34 and 35 are provided on the outlet 32 and drip feed 33. Air is returned to the fan 15 from the condenser 23 through a duct 37 for

recirculating through the drying chamber 14. Make-up air may be added to the recirculating air at the fan 15 if desired.

The drying cycle takes from 1 to 2 hours. In general,
5 for normal staining, it is recommended that the drying cycle should be 2 hours. The garments are left in the drying chamber 14 for the 2 hours of the drying cycle, and during this time, the temperature of the air in the drying chamber is maintained in the range of 20°C to
10 40°C. Preferably, the temperature of the air in the drying chamber 14 is maintained at 30°C. At the end of the 1 to 2 hour drying cycle, water and perchlorethylene should have been evaporated from the fabric 1 of the garment 11 to a point where further
15 evaporation is not practical. However, where a garment has been subjected to excessive staining, which necessitates extensive treatment with steam and the solution of detergent and perchlorethylene, the time period of the drying cycle may have to be increased in
20 order to cope with the additional volume of water and perchlorethylene in the fabric.

On removal from the drying chamber 14, the garment 11 is ready for dry cleaning.

It has been found that the method for removing a stain

from a fabric article according to the invention provides new and surprising results. It has been found that in substantially all cases, the method removes the stain entirely, even on the most delicate of fabrics.

5 Furthermore, it has been found that where delicate fabrics are excessively stained, all stains have been removed. In fact, it has further been found that the removal of the stains is achieved without any damage to the fabric, and in particular, it has been found that 10 even in the most delicate fabrics relatively no disturbance of the fibres of the fabric occurs and furthermore, relatively no shrinkage or colour loss occurs.

Why this is so is not fully understood, however, the 15 following explanation is advanced as being a possible reason for the new and surprising results. It is believed that the almost total evaporation of the water and perchlorethylene from the fabric prior to placing the garment in the dry cleaning apparatus for dry 20 cleaning significantly contributes to the new and surprising results being achieved from the method of the invention. It is believed that by evaporating the water and perchlorethylene at a relatively low temperature, relatively slow evaporation occurs, and 25 this, it is believed, reduces the likelihood of disturbance to the fibres of the fabric, and

accordingly, shrinkage is avoided. It is believed that in processes known heretofore where the garment is placed in the dry cleaning apparatus for dry cleaning immediately after being treated with the water and

5 perchlorethylene causes the perchlorethylene and in particular the water to evaporate at such a relatively rapid rate that disturbance is caused to the fibres of the fabric which result in shrinkage. It is also believed that the relatively rapid evaporation of

10 perchlorethylene and water leads to colour loss.

While a particular drying apparatus has been described for use with the method of the invention, any other suitable drying apparatus may be used. Indeed, it is believed that the drying step of the method could be

15 carried out in a room without any particularly special ventilation. The benefit, however, of using the drying apparatus is that the perchlorethylene and water are collected, and since perchlorethylene is a CFC gas, discharge of perchlorethylene into the environment with

20 the consequent damage to the environment is avoided.

While the method of the invention has been described as comprising the steps of applying steam to the fabric in the form of a jet directed on the fabric, the steam could be applied by any other means, for example, steam

25 may be percolated through the fabric or could be

applied by any other suitable means. Needless to say, instead of steam, water could be applied to the fabric to remove the stain.

While a particular solution of detergent and perchlorethylene has been described, any other suitable solutions could be used without departing from the scope of the invention. Indeed, it is envisaged that the detergent may constitute in the range of 5% to 20% by volume of the solution, while the perchlorethylene may constitute in the range of 80% to 95% by volume of the solution without departing from the scope of the invention, and it is believed that no adverse results using the method would occur. Indeed, it is believed that optimum results are obtained with a solution comprising 10% detergent by volume of the solution and 90% perchlorethylene by volume of the solution.

Further, it will be appreciated that while a particular detergent has been described, any other suitable detergent may be used.

Needless to say, any other suitable method of applying the solution of detergent and perchlorethylene may be used besides dabbing. Further, it is envisaged that the solution of detergent and perchlorethylene may be other than liquid, for example in certain cases, it is

envisioned that a powder solution of detergent and perchlorethylene may be used.

While the solution of detergent and perchlorethylene has been allowed to soak into the fabric for 5 minutes 5 prior to placing the fabric in the drying environment, this, while it is preferable, is not necessary. Further, it is envisaged that where the solution of detergent and perchlorethylene is allowed to soak into the fabric, the solution may be allowed to soak into 10 the fabric for any suitable time, although preferably for a time period in the range of 2 to 10 minutes.

It will also be appreciated that while the drying step of the method for evaporating the water and perchlorethylene has been described as being carried 15 out in an air medium in the drying apparatus, any other suitable drying medium could be used. Further, it is envisaged that the drying step may be carried out at temperatures other than those described. In fact, it has been found that the drying step may be carried out 20 at any temperature up to 60°C, and preferably, at a temperature in the range of 15°C to 45°C. However, it is believed that optimum results are achieved when the temperature range is maintained between 25°C and 35°C.

It is envisaged that in general the drying time

required to evaporate the water and perchlorethylene will be in the range of 1 to 4 hours, and normally will be in the range of 1 to 2 hours. In certain cases, the drying time may vary considerably. For example, in 5 cases where the drying medium is of relatively low humidity, a considerably shorter drying time period may be sufficient, for example, in certain cases, it is envisaged that the drying time of the drying cycle may be as low as 20 minutes. In other cases, where the 10 relative humidity of the drying medium is relatively high, considerably longer time periods for the drying cycle may be required. Indeed, it is envisaged in certain cases the time period of the drying cycle may be up to 24 hours, and even longer.

CLAIMS

1. A method for removing a stain from a fabric article, the method comprising the following steps in the following order:

5 applying water or steam to the fabric in the area of the stain,

applying a solution of detergent and perchlorethylene in the area of the stain,

10 subjecting the fabric to a drying environment at a temperature not exceeding 60°C for evaporating water and perchlorethylene from the fabric,

on substantially all of the water and perchlorethylene being evaporated from the fabric,

subjecting the article to a dry cleaning process to remove residual staining in the fabric.

15 2. A method as claimed in Claim 1 in which the drying environment is at a temperature in the range of 15°C to 45°C.

3. A method as claimed in Claim 2 in which the drying environment is at a temperature of 30°C.

20 4. A method as claimed in any preceding in which the fabric article is subjected to the drying environment for a time period of up to 24 hours.

5. A method as claimed in Claim 4 in which the fabric article is subjected to the drying environment for a time period in the range of 1 hour to 4 hours.
- 5 6. A method as claimed in Claim 5 in which the fabric article is subjected to the drying environment for a time period of 2 hours.
7. A method as claimed in any preceding claim in which the drying environment comprises a drying medium.
- 10 8. A method as claimed in Claim 7 in which the drying medium is air.
9. A method as claimed in any preceding claim in which the solution of detergent and perchlorethylene is applied to the fabric while the fabric is wet after the application of water or steam.
- 15 10. A method as claimed in Claim 9 in which the solution of detergent and perchlorethylene is applied to the fabric immediately after the application of water or steam.
- 20 11. A method as claimed in any preceding claim in which the solution of detergent and perchlorethylene is applied to the fabric by dabbing.

12. A method as claimed in any preceding claim in which the solution of detergent and perchlorethylene is in liquid form.

13. A method as claimed in any preceding claim in
5 which the solution of detergent and perchlorethylene is permitted to soak into the fabric prior to subjecting the fabric article to the drying environment.

14. A method as claimed in Claim 13 in which the
solution of detergent and perchlorethylene is permitted
10 to soak into the fabric for a time period in the range
of 2 minutes to 10 minutes.

15. A method as claimed in Claim 14 in which the
solution of detergent and perchlorethylene is permitted
to soak into the fabric for a time period of 5 minutes.

15 16. A method as claimed in any preceding claim in
which the solution of detergent and perchlorethylene
comprises detergent in the range of 5% to 20% by
volume of the solution and perchlorethylene in the
range of 80% to 95% by volume of the solution.

20 17. A method as claimed in Claim 16 in which the
solution of detergent and perchlorethylene comprises

detergent in the range of 10% by volume of the solution and perchlorethylene in the range of 90% by volume of the solution.

18. A method as claimed in any preceding claim in
5 which the detergent is a non-water based detergent.

19. A method as claimed in Claim 18 in which the detergent is a detergent sold under the Trade Name TAIFUN HOCHKONZ by Seitz GmbH.

20. A method as claimed in any preceding claim in
10 which the steam is applied to the fabric article in a jet stream.

21. A method as claimed in any preceding claim in which the fabric article is placed on a flat surface and the steam and solution detergent and
15 perchlorethylene are applied to the fabric on the flat surface.

22. A method as claimed in any preceding claim in which the water and perchlorethylene evaporated during the period the fabric article is in the drying
20 environment is collected.

23. A method as claimed in Claim 22 in which the

collected water and detergent evaporated from the fabric article while the fabric article is in the drying environment is condensed.

24. A method as claimed in Claim 22 or 23 in which the
5 collected evaporated water and perchlorethylene are separated for recycling.

25. A method as claimed in any preceding claim for removing a stain from a fabric article of silk fabric.

26. A method as claimed in any preceding claim for
10 removing a stain from a fabric article of wool.

27. A method as claimed in any preceding claim for removing a stain from a fabric article of natural fibres.

28. A method for removing a stain from a fabric article, the method being substantially as described
15 herein with reference to and as illustrated in the accompanying drawings.

29. Apparatus for drying a fabric article in accordance with the method of any of Claims 1 to 28,
20 the apparatus comprising a housing defining a drying chamber for receiving the fabric article and a drying

medium, an outlet from the drying chamber for delivering evaporates from the fabric article, and collecting means communicating with the outlet for collecting the evaporates.

5 30. Apparatus as claimed in Claim 29 in which condensing means is provided for condensing the evaporates prior to collection.

10 31. Apparatus as claimed in Claim 29 or 30 in which the collecting means separates the condensed evaporates.

32. Apparatus as claimed in any of Claims 29 to 31 in which the collecting means comprises a tank in which the condensates are collected and allowed to settle.

15 33. Apparatus as claimed in any of Claims 29 to 32 in which the apparatus comprises heating means for heating the drying medium.

34. Apparatus as claimed in Claim 33 in which the heating means comprises a heating coil mounted in the drying chamber.

20 35. Apparatus as claimed in any of Claims 29 to 34 in which the drying medium is air.

36. Apparatus as claimed in any of Claims 29 to 35 in which an inlet is provided to the drying chamber for delivering the drying medium into the drying chamber.

37. Apparatus for drying a fabric article, the
5 apparatus being substantially as described herein with reference to and as illustrated in the accompanying drawings.

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Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields		Search Examiner
(i) UK CI (Edition K)	DIP PN PE PDV PDX PFX PJ PG PH PK DIA	M ELLIOTT
(ii) Int CI (Edition 5)	D06L 1/22	
Databases (see over)		Date of Search
(i) UK Patent Office		
(ii)		24 MARCH 1992

Documents considered relevant following a search in respect of claims

1-28

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1277580 (BROWN & GREEN LTD) whole document	1 at least
X	GB 719114 (M BLAU) whole document	1 at least

SF2(p)

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

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